

SPS Chapter Report 2019-2020

University of California, Berkeley (Zone 18)

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Introduction

*“No one can whistle a symphony. It takes a whole orchestra to play it.”
—H.E. Luccock*

Berkeley SPS has a proud history providing a welcoming and rich environment to the undergraduate physics community at UC Berkeley, including many members of the national Society of Physics Students. Despite the large-scale disruption caused by COVID-19 in the latter portion of the school year, the Berkeley chapter of SPS has made significant progress in maintaining and introducing a variety of services to both the undergraduate community in Physics at Berkeley as well as the community.

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Part I: National and Regional SPS

“No one can whistle a symphony. It takes a whole orchestra to play it.”

—H.E. Luccock

Involving a number of National SPS members and having hosted the Zone 18 meeting in 2015, the Society of Physics Students at UC Berkeley is committed to the mission of the national organization. Berkeley SPS continued the trend this year by engaging with other chapters in our zone at the SPS Zone 18 meeting at Sacramento State University (CSUS). Moreover, by hosting the U.S. qualifying competition of the International Physicist’s Tournament (IPT), Berkeley SPS further connected with other SPS chapters at Rice University and UC Merced. Lastly, due to the efforts of our chapter in promoting good mental and physical health practices, Berkeley SPS was featured in the SPS Observer.

Sacramento Meeting (1 February 2020)

Berkeley SPS sent two representatives to the Zone 18 SPS meeting held at CSUS in Sacramento, CA: President Nicholas Rui (Fall 2019-Spring 2020) and Former President Maya Vranas (Fall 2018-Spring 2019). At the meeting, the Berkeley representatives participated in a number of activities and talks organized by the local chapter (e.g. a tour of the California State Capitol Museum and a Planetarium Show). Moreover, our members connected with students from the CSUS Chapter and the UC Davis Chapter, and shared their experiences as students in physics and further discussed potential inter-chapter outreach collaborations that are planned to be realized in the coming academic year.



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(Above) At the 2020 Zone 18 Meeting, our 2018-2019 President Mayia Vranas (left) and our 2019-2020 President Nicholas Z. Rui (right) represented Berkeley SPS!



(Above) Berkeley SPS participated in a tour of the California State Capitol Museum organized by the chapter at CSUS. The tour gave participants of the Zone meeting an opportunity to connect personally as students of physics at the University level!



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(Above) Also at the 2020 SPS Zone 18 meeting, Berkeley SPS learned about the outreach activities of other Northern California SPS chapters. Learning about such activities has bolstered collaboration between chapter with regards to outreach!

International Physicists' Tournament (7-8 December 2019)

The International Physics Tournament is a world-class event held in Europe. Each country sends one team to compete, and before that, multiple competitions are held in a country at the state or national level to determine qualification. Traditionally, the United States has lacked representation in IPT until the 2018-2019 school year when Berkeley SPS hosted the first national IPT qualifiers which included several Berkeley teams.

This year, with the lead of the Projects Coordinators Siddhant Mehrotra and Yonna Kim, Berkeley SPS invited multiple SPS chapters from across the United States. Students from the chapter at Rice University, UC Merced, and UC Berkeley came together during a two-day event where they battled several intriguing physics-based problems. In each round, each team volunteered one person to be either the Presenter, Opposer, and Reviewer. The Presenter explained their solution to a problem, the Opposers presented inconsistencies in the original solution or provided a different explanation, and the Reviewer mediated the discussion. Judges consisting of a panel of graduate students and professors awarded points and provided feedback. In the end, the team representing the chapter from Rice University received the opportunity to represent the United States. The Berkeley SPS team came in a close second, and consisted of juniors Erika Hathaway, Siddhant Mehrotra, sophomores Miguel Ceja and Shantanu Kadam (captain), and freshmen Brandon Abrego and Siddhant Mal. Students who would not have otherwise met were able to share valuable experiences and learn different thinking styles of physical phenomena, forming lifelong friendships and respect. Efforts such as this closely follow the mission of the national SPS chapter.



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(Above) Berkeley SPS hosted the second annual United States competition of the international physicists' tournament. Here, we see teams from three SPS chapters from across the country using their wit to solve complex physics questions!



(Above) During the International Physicists' Tournament, teams spent time presenting their solutions to complex problems as well as reviewing the solutions of their competitors.



(Above) The Berkeley team is hard at work trying to develop their winning strategy. Pictured here from (left to right) is Vice President Erika Hathaway, Miguel Ceja, Projects Coordinator Siddhant Mehrotra, Brandon Abrego, and Team Captain Shantanu Kadam.



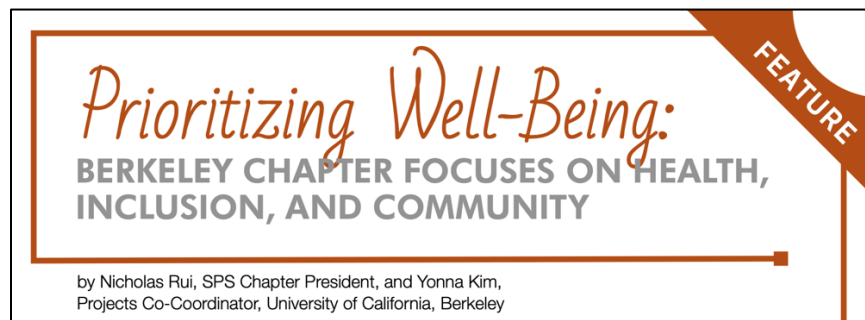
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	Rice	Berkeley	Merced
A-14	reporter - Mathews	opponent - Siddhant	reviewer - Ibrahim
Bean	6, 7, 9, 9, 9	8, 8, 8, 8, 7	7, 7, 6, 9, 6
B-14	opponent - Mathews	reviewer - Shantanu	reporter - Ibrahim
Electronics Capers	9, 8, 7, 9, 9	10, 9, 10, 9, 8	5, 7, 5, 6, 5
C-13	reviewer - Ayush	reporter - Siddhant	opponent - Shantanu
Pickle	7, 9, 7, 7, 7	7, 7, 5, 7, 9	7, 7, 4, 7, 7

(Above) The final score! Projects Coordinator Yonna Kim remained impartial in keeping the score which leaned in favor of the team from Rice University. Despite the fierce competition, the friendships made between SPS chapters at this event will last a lifetime.

Feature in the SPS Observer (November 2019)

Berkeley SPS was fortunate enough to author a feature in the winter edition of the SPS Observer for our focus on the mental and physical well-being of its members, as demonstrated in our activities described in the 2018-2019 Chapter Report. We hope that other SPS chapters were able to reflect on our methods and appropriately react in their own communities. We look forward to promoting ideas for engagement with both the National SPS and individual members in our communities.



(Above) The letter head of Berkeley SPS' feature in the SPS Observer. The feature illustrates our commitment to the mental health and physical health of our members!



Part II: Local Campus Engagement

“Find a group of people who challenge and inspire you, spend a lot of time with them, and it will change your life!”

—Amy Poehler

The Berkeley SPS forms the official voice of the undergraduate population of the University of California, Berkeley Department of Physics and as such holds a number of regular local events. These events are either social, academic, or professional in nature and help shape the culture of the department by promoting equity and inclusion and good mental health practices. In the 2019-2020 school year, we not only strengthened our presence in the department and students’ experiences but unveiled new programs that addressed overlooked problems. In the first part of this section, we will describe traditional Berkeley SPS characteristics that any member of UC Berkeley can enjoy. We then explain collaboration with other student campus groups, as well as with UC Berkeley’s physics department. In the last part of this section, we detail several of the new programs led by our student board.

Part A. Traditional Programs

General Meetings

Until campus suspension of group gatherings in the spring semester, Berkeley SPS held weekly hour long meetings that were either academic or social in nature. On average, 20+ students actively participated in general meetings. Below, we highlight select weekly meeting topics.



(Above) Berkeley SPS members gathering at a general meeting at the start of the Spring semester discussing Fermi questions in the “Order-of-Magnitude” game!

Fall Inaugural Meeting: Hike to the Big C! (6 September 2019)



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Berkeley SPS kicked off the 2019-2020 school year with its inaugural meeting held in LeConte 2, one of the biggest lecture halls available in the Physics Department at UC Berkeley, with more than 100 students in attendance. After all officers were introduced, new students were given an overall introduction of SPS and told the ways one could participate. The meeting concluded with a hike to the Big C, a local tourist attraction that overlooks the UC Berkeley campus. Though several attendees were strangers at the beginning of the hike, the event concluded with people laughing like old friends!



(Above) Berkeley SPS's first general meeting of the semester was packed! The crowd watches with excitement as the officer board introduces themselves and informs them of the wonderful activities planned in the coming year.



(Above) Part of the officer board (left to right: Outreach Officer Charlie Cummings, Secretaries Aini Xu and Eden McEwen, Vice Presidents Erika Hathaway and Rahul Sahay, President Nicholas Rui) watches as Rahul introduces the newly revised mentorship program as a central theme of the year!



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(Above) President Nicholas Rui takes a selfie with the Big C crowd! We can see members of the crowd trying to use the right-hand rule!

Meet Your Mentor (11 September 2010)

One of the major goals of Berkeley SPS in the 2019-2020 school year was to make mentorship a core part of the club's weekly meetings. To this end, our second general meeting focused on matching groups of mentees, who had signed up for the mentorship program the week prior, with two volunteering mentors. The meeting had several icebreakers aimed at helping mentors learn what they can do for the mentees and helping mentees feel comfortable with their mentors, and a warm and welcome tone was set for the remaining meetings in the school year.

Your First Research Project (18 September 2010)

Early on in the semester, Berkeley SPS sought to educate its younger members as to the ins and outs of undergraduate research and as such put on an interactive skit, led by Vice President Erika Hathaway and President Nicholas Rui, at its third general meeting telling the tale of "Your First Research Project." The skit detailed the different types of undergraduate research, the necessary skills upon entering, and the typical roadblocks that are natural as one embarks on the exciting journey of science!

Types of Physics (23 October 2019)

In the middle of the semester after the first wave of midterms, Berkeley SPS helped introduce its younger members to the amazing variety of physics that are researched at UC Berkeley.



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Undergraduates from each area of expertise (e.g. Atomic Physics, Condensed Matter Physics, High Energy Physics, and the like) were called in to provide a broad description of their field as well as the relevant courses/skills necessary to perform research in their area. The event allowed lower classmen to meet upper classmen who work in their area of interest and even led to several lower classmen getting offers for undergraduate research!

LaTeX Workshop (12 November 2019)

Secretary Aini Xu, Vice President Rahul Sahay, and past President Mayia Varanas wrote an educational yet goofy LaTeX manual, and led students through an introductory crash course on the basic concepts. Each section of the document introduced a LaTeX function: useful LaTeX packages, different ways to make sections and lists, writing math (equations, greek letters, sums and integrals, etc.), font manipulation, floats (figures, tables), and references. It was quite well-received and found helpful!

Course-Evaluations Party (4 December 2019)

In the second to last general meeting of the fall semester, SPS promoted students to fill out their course evaluations with a special treat. In many ways, SPS is the link between the administration and students of the physics department. Because course evaluations are the primary ways students' voices are heard, we dedicate an entire meeting to filling them out over snacks!

Secret Schrödinger (11 December 2019)

In the name of bringing together the community and having a final send off for the Fall semester, we host an annual gift exchange in Schrodinger's name (akin to canonical Secret Santa game). Participants had about two weeks to select \$15 or less gifts for their giftee. During the event, students took turns opening their gifts and trying to guess who they were from, surrounded by holiday treats, good food, and jolly company while taking a break from studying for finals. This event has become a tradition that many undergraduates (in physics and related departments) look forward to. Despite the growing number of participants, SPS ensures that everybody who wants to participate, is able to!

Spring Inaugural Meeting: Order-of-Magnitude Game (5 February 2020)

At the beginning of the Spring semester, Berkeley SPS once again had a large general meeting re-introducing the officer board to the general members and announcing the new activities for the semester to come! After the announcements, Berkeley SPS kicked off the new semester right by splitting the crowd into 6 teams of 12 (on average) and hosting an "Order-of-Magnitude" game. Several tantalizing Fermi questions were asked and to the surprise of all involved, were answered more or less correctly!



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(Above) A fierce competition designed by Vice President Rahul Sahay ensues as six teams attempted to answer puzzling Fermi questions! (from left to right: Outreach Officer Charlie Cummings, Media Officer Ben Lloyd, Ronan Alam)

Overcoming Personal Challenges: Exercises in Mental Health (4 March 2020)

Inspired by the Imposter Syndrome workshop held during the last school year, Secretary Eden McEwen and Outreach Officer Charlie Cummings introduced the idea of imposter syndrome, named common beliefs that arise from it, and facilitated group discussions on how it is seen in our own lives. We discussed negative language used in the department, and positive alternatives to destructive language. Based on feedback from students, Berkeley SPS will be collaborating with the department to include a larger audience and emphasize the importance of creating an inclusive community for everyone.

Construction Competition (11 March 2020)

To promote a fun opportunity to work on teamwork building skills and creativity, we planned to match participants into small groups and provide construction materials for design challenges including the popsicle stick bridge and marshmallow spaghetti bridge. This event was unfortunately cancelled due to COVID, and many general members were disappointed.

A Comment on COVID-19 (16 March 2020)

On March 16th, 2020, the city of Berkeley, CA announced that its “shelter in place” order to slow the spread of COVID-19 throughout the Bay Area. Around this time, the University of California, Berkeley announced that all further instruction would take place online. In solidarity with these efforts, Berkeley SPS announced that all further SPS meetings would take place virtually. In order to avoid alienating students from different time zones (who make up a large portion of the undergraduate community), general meetings were cancelled for the rest of the semester. In spite of this, Berkeley SPS continued to hold virtual events for the undergraduate population weekly!



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SPS Minecraft Prom (06 May 2020)

The UC Berkeley Chapter of SPS traditionally throws a “prom” to celebrate the finale of the Spring Semester. It is typically held before Finals week so that the physics students in our department can say that they “did in fact attend parties in college” and didn’t “have a social life that increased since social distancing began”. Because of the COVID global pandemic, the prom could not be held in person this year. However, SPS prom is such a big event, and Projects coordinator Siddhant Mehrota and Media Officer Ben Lloyd undertook organizing the event on an online medium. In the end, a Minecraft replica of LeConte Hall was built, including appropriate features for rooms. Students were encouraged to purchase Minecraft (reimbursement provided on a case-by-case basis), and (free) discord was set up for communication and for individuals that didn’t want to play on Minecraft. The event was all in all a tremendous success and 40+ people tuned in to “join the party”.



(Above) Minecraft Banner for SPS Prom! Although the event was virtual, the fun was real!



(Above) Some late-staying attendees pose by the Minecraft LeConte built under the leadership of Projects coordinator Siddhant Mehrota and Media Officer Ben Lloyd!



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(Above) A close-up of Some late-staying attendees posing by the Minecraft LeConte.

Record of all General Meetings in the 2019-2020 School Year

Fall Semester Schedule

6 September 2019	Fall Inaugural Meeting: Big C Hike
11 September 2019	Meet your Mentor
18 September 2019	Your First Research Project
25 September 2019	A Game of Fire and Slides
2 October 2019	Physics Jeopardy
9 October 2019	A Stroll Through Physics
16 October 2019	Course Scheduling Advice
23 October 2019	Types of Physics
30 October 2019	Halloween Party
6 November 2019	SPS Movie Night
13 November 2019	LaTeX Workshop
20 November 2019	Friendsgiving
4 December 2019	Course-Evaluation Party
11 December 2019	Secret Schrödinger

Spring Semester Schedule

5 February 2020	Spring Inaugural Meeting: Order-of-Magnitude Game
12 February 2020	Valentine's Day Cookie Decoration
19 February 2020	Research: A Fresh Perspective
26 February 2020	Wholesome Crafts
4 March 2020	Overcoming Personal Challenges
11 March 2020	Construction Competition
6 May 2020	SPS Minecraft Prom

The SPS Room and the Snack Shack

184 LeConte Hall, better known as the “SPS Room”, is a small multi-purpose space. Berkeley SPS events are planned in the room, and SPS members and the physics student body can meet to relax or study together, get to know the officers of SPS, and answer the fill-in fun blank question



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of the week on the whiteboard.

The main highlight of the SPS room is the snack shack, which is a convenient and affordable place for students to find snacks to eat while taking a break from working hard on physics (or any academics). These snacks, under Snackmaster Ivan Chernyev, include Martinelli's Sparkling apple juice, fruit snacks, chips, ice cream, and more. This past year, the snack shack continued to expand its selection. The most well-received new additions were Snapple and It's It ice cream, but choices included a focus on (newly added) healthy food such as vegetable spring rolls, fruit cups, milk, and protein bars.

The importance of the Snack Shack in maintaining students' dietary requirements is best exemplified by the Snack Shack food review Instagram account, [@berkeleygpsfoodreview](#).



(Above) Bulletin Board hung outside the SPS room.



(Above) (From left to right) Nicholas Rui, Erika Hathaway, Heidi Hoo, Yonna Kim, and Alec Shelley enjoy each other's company while lounging and working in the Berkeley SPS snack shack.



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(Above) Berkeley SPS snack master, Ivan Chernyshev, showing off a newly restocked snack shack. The snack shack is adorned by local art depicting faculty in the UC Berkeley Physics Department (shown on right: Michael Crommie).

The SPS Barbecue

Providing an excellent opportunity for the physics community, student, staff and faculty alike to socialize and network, Berkeley SPS hosts triweekly open-air barbecues. These barbecues not only foster community within the department, but also draw in passers-by, enticed by the cheerful atmosphere and delicious scents cooked up by Grillmasters Kobe Hassenzhal and Kevin Chang. Alongside their role of community building and networking, these barbecues also serve as excellent fundraising opportunities, providing the club with necessary income for other activities that are not tied directly to the department bureaucracy enriching the variety of events held for the undergraduate community.

We were able to hold 7 barbeques in the school year: 9/13/2019, 10/11/2019 (postponed to 10/18/2019), 11/8/2019, 11/22/2019, 1/24/2020, 2/14/2020, 3/13/2020



(Above) Berkeley SPS Grillmasters, Kevin Chang (left) and Kobe Hassenzhal (right) give smiles as they get the grill warmed up in preparation for the BBQ!



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Faculty-Student Lunch

Abbreviated FSL, coordinators Arani Archaya and Wendy Wan organize a key event in bringing students and faculty together. Discussion on life and research, career paths, and more are made over pizza, and students realize that faculty are intriguing people as well. Throughout the school year, 9 FSLs were held:

Faculty-Student Lunch Schedule

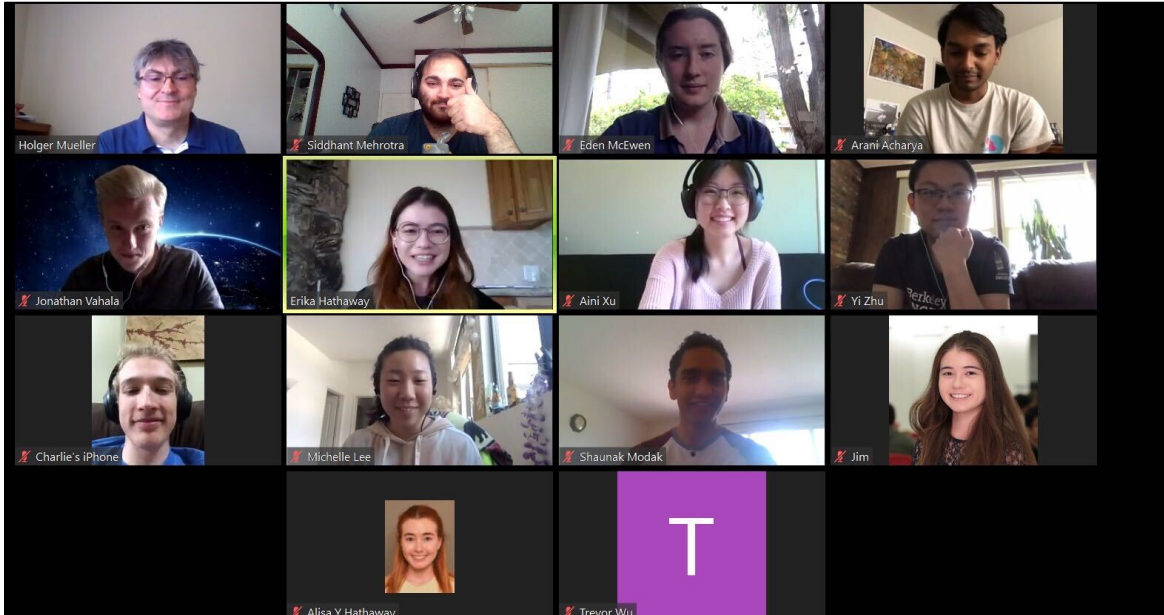
29 July 2019	Robert Birgeneau
30 September 2019	Roger Falcone
16 October 2019	Paul Kalas
5 November 2019	Eugene Chiang
5 November 2019	Eliot Quataert
20 November 2019	Irfan Siddiqi
25 February 2020	Ehud Altman
7 April 2020	Holger Mueller (Held Virtually)



(Above) UC Berkeley Professor Irfan Siddiqi talks to students about his life experiences and his research during Berkeley SPS' Faculty-Student Lunch over Indian food from a local business.



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(Above) UC Berkeley Professor Holger Mueller talks to undergraduates via Zoom during Berkeley SPS' first ever virtual faculty-student lunch. Students were polite and muted themselves as they chewed on their lunch, and asked many questions!

Socials

In the University of California, Berkeley, Department of Physics, SPS serves as an inclusive organization that provides a social network for undergraduates. Acknowledging the importance of a **community** and **mental health**, SPS socials give physics students at a chance to unwind and kick up their heels. Due to the COVID-19 pandemic and the Pacific Gas & Electric power outages, most of the planned socials for the year were cancelled. However, Berkeley SPS was able to provide some notable socials in the 2019-2020 academic year.

SPS Holiday Skit (6 December 2019)

At the annual physics department holiday party, SPS traditionally performs a ten to fifteen-minute skit. This year, SPS performed a tongue-in-cheek rendition of A Christmas Carol, distinctly abridged and convolved with physics-specific humor that only its students and practitioners would understand.

Observing physics undergraduates, graduate students, postdoctoral scholars, and faculty followed the story of cynical Professor Scrooge (played by Projects Coordinator Siddhant Mehrotra), who is visited by three spirits of Christmas Past (President Nicholas Rui), Christmas Present (Outreach Coordinator Charlie Cummings), and (Carol) Christmas Future (Projects Coordinator Yonna Kim). The skit also featured the talents of Media Chair Benjamin Lloyd ("Undergrad 1") as well as Pat Sicurello ("Graduate Student"), Cooper Cheng ("Demoted Postdoc"), Kate Lamont ("Undergrad 2"), Jinze Wu ("Undergrad 3"), Aaron Elersich ("Professor Danerstan"), Christian Ramos ("Little Scrooge"), and Shaunak Modak ("Future Scrooge"). The holiday party is a great way for students and faculty to connect through a wondrous night of Christmas cheer!



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(Above) The cast and crew of Berkeley SPS's rendition of "An Academic Christmas Carol". (Top Row from Left to Right) Toby Dixon, Charlie Cummings, Nishant Mishra, Debayan Bandyopadhyay, Aaron Elersich, Allison O'Brien. (Middle Row from Left to Right) David Abramovich, Jaime Zendejas, Shaunak Modak, Jinze Wu, Eden McEwen. (Bottom Row from Left to Right) Yonna Kim, Patrick Siccurello, Aini Xu, and Nicholas Rui

Bowling Night (7 February 2018)

This year SPS hosted another wonderful bowling night, subsidizing the lane and shoe rental for about 15 students. Two rounds were played while munching on pizza and other dinner snacks, with varying levels of bowling success. Another highlight was the camaraderie among students as we utilized public transit to and from the community bowling alley, giving students a chance to explore further out from campus.



(Above) Berkeley SPS' Bowling Squad takes to the streets of Berkeley to show off their ability to knock down pins using a massive Urethane spheres!



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(Above) (from left to right) Faculty-Student Lunch Coordinator Arani Acharya, Vice President Erika Hathaway, and President Nicholas Rui take a selfie to commemorate the pure glee of bowling.

Laser Tag: SPS versus MUSA (5 April 2019)

Members from SPS faced off against their sworn rivals, the Math Undergraduate Student Association (MUSA), in a dual of the highest caliber: laser tag. Equip with laser rifles, SPS and MUSA fought it out on the battlefield outside of the Valley Life Sciences Building. Although, in the end, MUSA reigned victorious, Berkeley SPS will be back next year to take back our throne!



(Above) President Nicholas Rui takes a quick photo while participating in a battle to defend the honor of Berkeley SPS.

Part B. Collaborations with other clubs



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Math and Physics Joint Lecture Series

Seeking to serve students whose interests lie at the intersection of mathematics and physics, Berkeley SPS partnered up with the MUSA to create a lecture series in Mathematical Physics presented in a manner accessible for undergraduate: *The Mathematics and Physics Joint Lecture Series* (MaPJLS). The lecture series was set to take place on a monthly basis and was kicked off with a lecture given by Professor of Mathematics, Lin Lin entitled “Grassmann manifolds, gauges, and quantum chemistry.” The kick-off lecture was quite successful with over 50 participants. Unfortunately, all plans for future lectures in Spring 2020 were cancelled due to the COVID-19 pandemic. Nevertheless, Berkeley SPS plans on continuing its collaboration with MUSA in the Fall and host a new MaPJLS.



(Above) Professor Lin Lin of the UC Berkeley Department of Mathematics giving his lecture entitled “Grassmann manifolds, gauges, and quantum chemistry” as participants watch attentively.

Berkeley Integration Bee

Taking inspiration from the famous Integration Bee at the Massachusetts Institute of Technology, Berkeley SPS reached out to MUSA to jointly organize UC Berkeley’s first integration competition. Berkeley SPS contributed in both the organization logistics of the event, as well as providing a large amount of the integrals used in the competition. With over 200 attendants and over 70 participants, the competition was wildly successful and very competitive. In order to break down, the participant pool, a preliminary round was held that narrowed down the competition to just 10 people who showcased their skills in a Grand Finale.



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(Above) Crowds assemble to witness master integrators battle it out on a stage!



(Above) Following the event, new bonds were formed between math and physics students who were able to find common ground in their love for integration!

Part C. Collaborations with Physics Department

Meetings with Physics Advisors

Due to the fact that the Berkeley's SPS Chapter takes the role of "the official voice of the undergraduate community," President Nicholas Rui and Vice Presidents Rahul Sahay and Erika Hathaway regularly meet with the undergraduate advisors of the UC Berkeley Department of Physics Amanda Dillon (Fall only), Kathleen Anna Cooney (Spring only), and Kathy Lee. During these meetings, Berkeley SPS typically was charged with communicating the grievances of the



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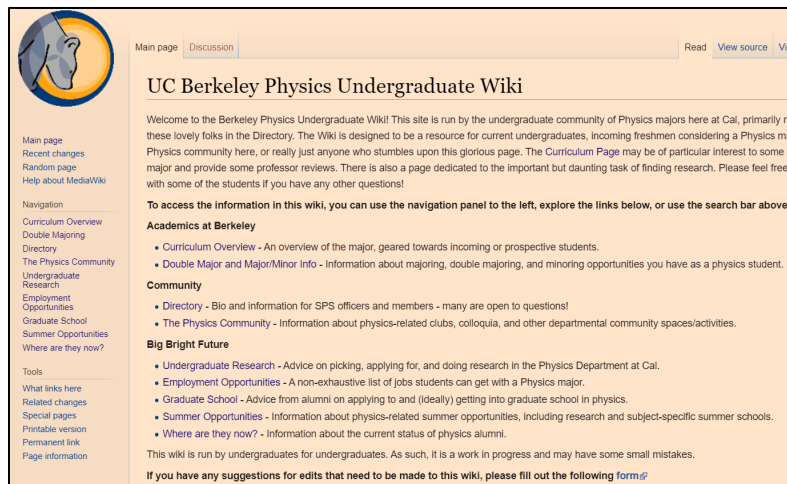
undergraduate physics community. For example, SPS has helped lead the effort to get an equal number of men’s and women’s bathrooms in the physics building, LeConte Hall. Furthermore, Berkeley SPS officers have been key players in most of the conversations regarding equity and inclusion in the physics department.

Establishment of Department Piazza Page

Berkeley SPS has been a major proponent for increasing communication throughout the physics department. Namely, in order to facilitate conversation between fellow undergraduates, the faculty, and department advising, Berkeley SPS put forward a formal proposal to the department for the establishment of a department-wide Piazza page. The purpose of Piazza would be to allow students to 1. ask anonymously about a variety of department resources (e.g. mental health resources), 2. engage with the faculty via department held AMA’s (ask me anything), 3. search for a study group, etc. The department has recently agreed to the establishment of this Piazza page and we believe that it will allow for younger students to better situate themselves within Berkeley physics, thereby improving retention rates in the department.

Establishment of Department Wiki Page

This semester we launched our UC Berkeley Physics Undergraduate Wiki, hosted at sps.berkeley.edu/wiki. It serves as an all-in-one place for physics undergrads to find a multitude of information about studying physics here at Cal, including curriculum overview, major/minor information, potential double majors, directory of people in the community, finding research, employment opportunities, grad school, etc. It has been written and will be maintained by SPS members, accurate to the best of our fact-checking abilities. Our goal for the wiki is to consolidate information and make it easier for the physics community to find what they seek.



(Above) A snippet previews the landing page of the newly created wiki!

Assistance in planning department events



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Berkeley SPS has been the primary source for volunteers for department events. A few of the most notable events that Berkeley SPS assisted with are briefly described below.

Emilio G. Segre Lecture (1 November 2019)

The annual Emilio Segrè Lecture honors the renowned Berkeley experimentalist by inviting world class scientists to speak to the whole department. This year Jocelyn Bell Burnell was invited to speak, and many of the SPS undergrads were able to attend her talk and speak with her after. SPS aims to promote and make more accessible keystone events like the Segre lectures.



(Above) Members of Berkeley SPS gather around Jocelyn Bell Burnell after her inspirational Segre Lecture.

Preventing Sexual Violence/Harassment (PATH TO CARE) (7 November 2019)

In partnership with the department and on campus resources, SPS invited Undergraduate Prevention Program Manager Mariana Matthews to speak to the physics community. Mariana has dedicated her career to the prevention of sexual and relationship violence and to educating her campus about trauma-informed response practices, and able to lead a powerful and informed talk for the community.

SPS Physics Career Talk Uttam Paudel (3 February 2020)

Working with UC Berkeley's undergraduate physics advisor Kathleen Cooney, VP Erika Hathaway and Secretary Eden McEwen invited former alumni Uttam Paudel to talk about his career path and experience at the Aerospace Corporation, providing students a rare glimpse into available options besides grad school from the perspective of a Cal alumnus.

Career & Graduate School Panels (15 April 2020 and 23 April 2020)



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Berkeley SPS helped promote the Berkeley physics's departments annual career and graduate panel. Panelists included SPS members and members of the officer board, and although through Zoom, was well populated.

Part D. New Initiatives

Destress with SPS

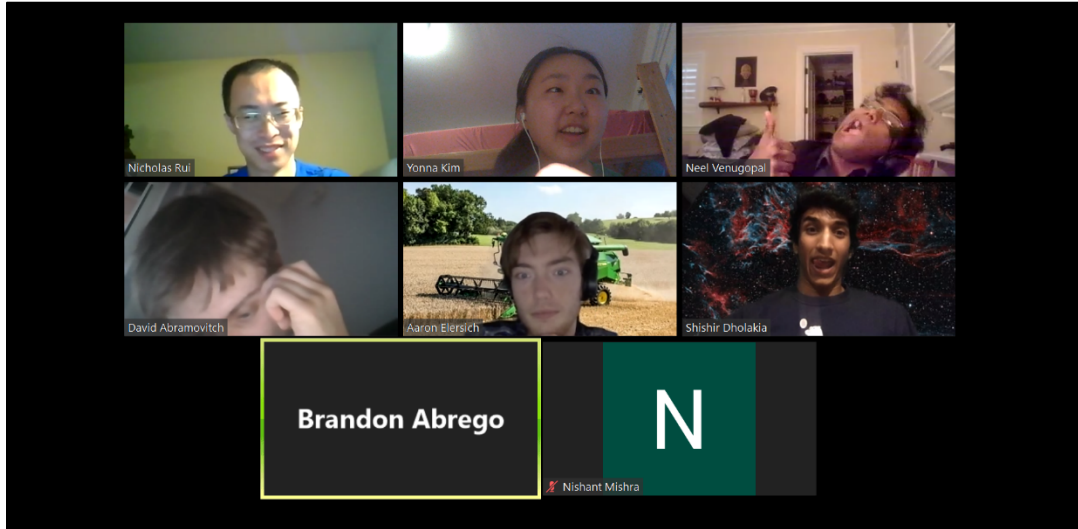
This year, SPS launched “DeStress with SPS”, a series of events dedicated to providing a space for students to enjoy fun activities together with an emphasis on encouraging positive mental health behaviors. Biweekly on Friday afternoons, students could gather together for a range of activities, from playing ultimate frisbee and soccer on Memorial Glade, coloring books and creating snowflakes, and going bowling. With the transition to the online semester, DeStress with SPS also transitioned to biweekly zoom calls where friends could catch up while playing virtual games together.



(Above) A group of DeStress with SPS participants led by Projects Coordinator Yonna Kim (bottom row, second from right) proudly hold up their Bob-Ross inspired drawings which were later used to brighten the main hall of LeConte.



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(Above) DeStress with SPS transitioned online, and students separated by COVID met each week to catch-up over a wide variety of zoom games.

Mentorship Program

This year, SPS revitalized its mentorship program with goals including introducing underclassmen and incoming transfers to the undergraduate physics community, providing resources (e.g. research, tutoring), and encouraging a balanced and healthy lifestyle.

The mentorship program was in a “family”, or group, format, with 2-3 mentors to 4-6 mentees in each family. Each family was grouped together based on availability and interests of each member. To give mentors some guidelines and ideas of how to maintain an active and inclusive mentorship group, a manual was created. The manual covered in expectations, logistics, and tips and tricks. Each mentorship group was expected to sit together during each SPS general meeting. The mentors and organizers met about twice a semester to check in and chat about progress, share tips, and give feedback. Additionally, all mentors and organizers belong in the same online chat so they could share ideas and experiences. During fall semester, each mentorship group had varying degrees of activity. Some met more frequently than others in the form of having lunch or dinners together. These outings were usually organized through social media chat groups like Facebook messenger, where mentees were free to ask questions to the mentors who would answer according to their own experiences. The mentors also served as emotional support on many occasions, since freshmen students experienced the imposter syndrome.

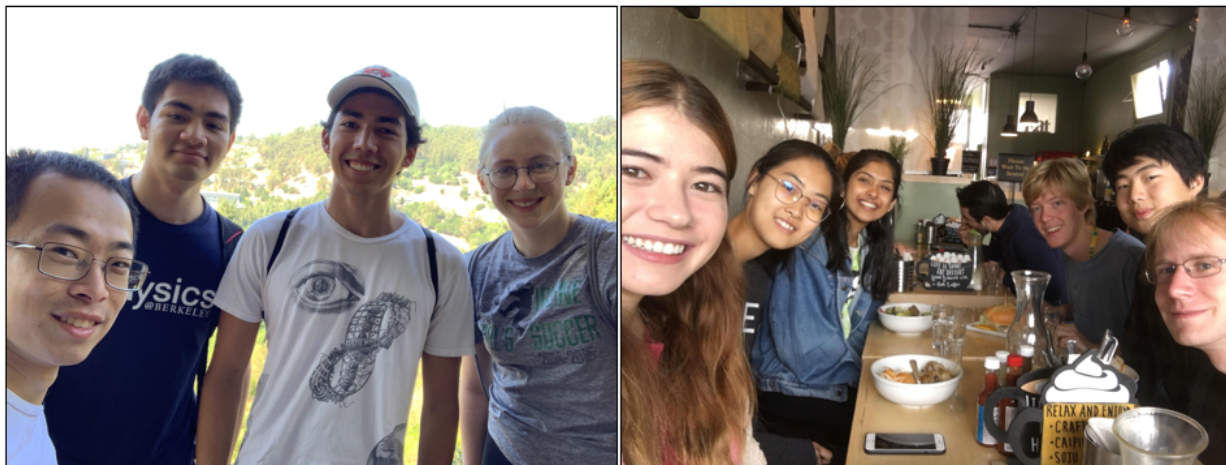
After the semesters, the organizers received a range of constructive feedback from mentors and gained experiences. Based on the reflection, new ideas were planned to be implemented in the next school year, including a weekly challenge program, activity and participation rewards system, and inter-family events. While this was an initial success, the process still needs further formalization and communication. SPS deeply cares about mentorship and the inclusivity it brings, and we look forward to further making the mentorship program fun and meaningful.



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(Above) (Left) Mentors Neel Venugopal and Aini Xu (also Organizer) pose for a selfie with some mentees after a group coffee run. (Right) Mentors Adam Molnar and Eden McEwen (also Organizer) take a photo for a memory of grabbing lunch with their mentees in between Tuesday classes.



(Above) (Left) Mentors Nicholas Rui and Allison O'Brien promoted healthy living by going hiking several times with their mentees during the school year. (Right) Mentors Erika Hathaway and Carter Turnbaugh explore Berkeley's cuisine with their mentees.

Undergraduate Seminars

Berkeley SPS organized the Physics Department's second installment of **Undergraduate Seminar** evening talks which gives undergraduate physics and astronomy students a platform to present their research (or general topic of interest). These seminars were founded with (and delivered on) the intention of making research-level physics **more accessible** to younger students and further increasing **communication** between upperclassmen and lowerclassmen. The seminars were also a fruitful networking avenue through which lowerclassmen were able to seek out upperclassmen mentors, with more than ten lowerclassmen joining research groups as a direct consequence.



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(Above) A compilation of photos from all nineteen undergraduate seminars held by Berkeley SPS in this past school year. Attending students heard about a large range of topics at an undergraduate level helping attendees understand that they too could pursue high caliber experiments!

Seminar Schedule

12 September 2019	Eden McEwen <i>Adaptive Optics Systems in the Search for Planets</i>
19 September 2019	Arjun Savel <i>Earth: Rare or Regular?</i>
26 September 2019	Benjamin Lloyd <i>Hybrid Quantum States: Quantum Acoustics</i>
10 October 2019	Nicholas Rui <i>Star Clusters: Many-Body Laboratories</i>
17 October 2019	Rahul Sahay



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	<i>Phase Transitions and the Higgs Boson! Connecting Physics at Different Scales!</i>
31 October 2019	Adam Molnar <i>RD53A/B Chip Probing for ATLAS</i>
7 November 2019	Yilun Ma <i>Stellar Flybys and Debris Disks: WHAT?</i>
14 November 2019	Christian Ramos <i>Be There or Be Cube (An intuitive guide to solving the Rubik's Cube)</i>
21 November 2019	Joshua Z. Lin <i>Searching for Supersymmetry</i>
13 February 2020	Fanghui (Wendy) Wan <i>Hunting for quantum materials: an experimentalist's guide</i>
20 February 2020	David Abramovich <i>How and Why We Simulate Quantum Mechanics in Materials + How and Why I Simulate Some QM in One Material</i>
27 February 2020	Siddhant Mal <i>Affine Structure of Euclidean Spacetime or Mathy Things in Physics</i>
2 April 2020	Ivan Chernychev <i>Applying the Atomic Nucleus to Problems in Particle Physics and Astrophysics</i>
16 April 2019	Shaunak Modak <i>Supermassive Black Holes in Galactic Dynamics</i>
30 March 2019	Timothy Guo <i>Trapping Electrons in Vacuum for Quantum Computing</i>

Physics Department Homework Parties

Homework parties are a department initiative to promote collaboration between different students by providing a late night (7:30-10pm) time for students to get together to work on homework, providing snacks and refreshments as well. These weekly “parties” were hosted by different physics clubs on a rotation basis. This year, SPS actively hosted homework parties for the department. Attendance reached up to 30 students in a night, spanning all grades. This initiative not only brings together students, but also introduces them to the core of undergraduate support systems around the department.

Physics 5A Study Hall

Physics 5A, the first college physics course taken by many physics majors at Berkeley, is notorious for its difficulty. Many of the challenges students face in 5A are not merely academic, but stem from a lack of community within the class because freshmen have not had time to interact and form study groups. In Fall 2019, outreach officer Charlie Cummings founded the **Physics 5A**



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Study Hall program, where Charlie tutored 5A for two hours a week, and provided a space for study groups to naturally form within the class. Although Charlie was (hopefully) a valuable resource to students in the class, the main benefit was the collaboration between the students themselves.

The 5A study halls were extremely successful in their pilot run in the 2019-2020 academic year. One student had even said they “wouldn’t still be in the major” if it weren’t for the program. Another benefit of the program is that by working with others, it becomes much clearer that physics is hard for everyone! It can be difficult to appreciate that it is natural to struggle through problem sets when there is a false narrative that you are the only one struggling, which is exposed as a lie when working with others. It is our hope that this program will not only improve the mental health of the students entering the department, but also improve diversity as well. The success of the program has led the Physics department to expand the program into Physics 5B as well, potentially into even more classes in the future. Stay tuned!



Part III: Interaction with Professional Physics Community

“It’s a lot easier to do good work when you have good words to say and work with good people.”

—Mark Harmon

Combining a **rigorous major curriculum** with **excellent research facilities**, Berkeley’s physics program consistently provides pathways for undergraduate students to participate in **cutting-edge science**. This past year, Berkeley’s undergraduates have left **deep footprints** in the academic landscapes of physics and astronomy, upholding the school’s long history of **pushing the frontier of human knowledge**. To this point, we summarize below the participation of UCB physics students in academic research: their participation in conferences, refereed publications, and so on.

Conference Attendance

CuWiP (Conference of Undergraduate Women in Physics)

In January 2020, SPS at Berkeley organized a group of students in physics and astronomy to attend the Conference for Undergraduate Women in Physics (CUWiP) held at the University of California, Irvine. Attendees presented research in talks and posters, met other womxn in departments all over the west coast, and engaged in conversation on improvements to be made in the physics department to increase the presence of minorities. Attendees included Ronan Alam, Jiani Chen, Katie Griffith (presented poster “Quantum Emitters in Monolayer Tungsten Diselenide”), Erika Hathaway, Yonna Kim, Bianca Luansing, Eden McEwen (presented talk “Preliminary Results of Adaptive Optics Test Bench”), Shreya Nagpal, Allison O’Brien, Dalila Robledo, and Aini Xu.



(Above) Berkeley SPS members including (from left to right) Ronan Alam, Eden McEwen, and Erika Hathaway represented themselves and Berkeley SPS at CuWiP and learned to ‘Zot’ with UC Irvine’s anteater mascot.



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Other Academic Conferences

Please note that the following list is not all-inclusive.

- (1) **Mayia Vranas, Arani Acharya** et al. *Ruthenium Substitution in Beta-Lithium Iridate*. APS March Meeting 2020, Denver, CO, March 2020. (contributed talk) **[cancelled due to COVID]**
- (2) **Rahul Sahay** et al. *Emergent Ergodicity at MBL/MBL Phase Transitions*. APS March Meeting 2020, Denver, CO, March 2020 **[cancelled due to COVID]**

Refereed Publications

Please note that the following list is not all-inclusive .

- (1) El-Badry, K.; Quataert, E.; Weisz, D. R.; **Choksi, N.**; Boylan-Kolchin, M.; *The formation and hierarchical assembly of globular cluster populations*. Mon. Notices Royal Astron. Soc., 2018.
- (2) Jia Yu, Meng Wang, Benjamin A. Frandsen, Hualei Sun, Junjie Yin, Zengjia Liu, Shan Wu, Ming Yi, Zhijun Xu, **Arani Acharya**, Qingzhen Huang, Edith Bourret-Courchesne, Jeffrey W. Lynn, and Robert J. Birgeneau; *Structural, magnetic, and electronic evolution of the spin-ladder system $BaFe_2S_{3-x}Se_x$ with isoelectronic substitution*, Phys. Rev. B 101, 2020
- (3) Wu, Shan and Yin, Junjie and Smart, Thomas and **Acharya, Arani** and Bull, Craig L. and Funnell, Nicholas P. and Forrest, Thomas R. and Simutis, Gediminas and Khasanov, Rustem and Lewin, Sylvia K. and Wang, Meng and Frandsen, Benjamin A. and Jeanloz, Raymond and Birgeneau, Robert J.; *Robust block magnetism in the spin ladder compound $BaFe_2Se_3$ under hydrostatic pressure*, Phys. Rev. B 100, 2019
- (4) **N. Z. Rui**, N. Y. Yao et al.; *Imaging stress and magnetism at high pressures using a nanoscale quantum sensor*, Science 306, 2019
- (5) **Nicholas Z. Rui**, Frederic A. Rasio et al.; *Modeling Dense Star Clusters in the Milky Way and Beyond with the CMC Cluster Catalog*, The Astrophysical Journal Supplement Series Volume 247, 2020
- (6) **Mayia Vranas**, James G. Analytis et al.; *High-temperature magnetic anomaly in the Kitaev hyperhoneycomb compound β - Li_2IrO_3* , Phys. Rev. B 101, 2020
- (7) **Mayia Vranas**, James G. Analytis et al.; *Hidden spin-orbital order in the Kitaev hyperhoneycomb β - Li_2IrO_3* , Phys. Rev. B 101, 2019
- (8) **Carter Turnbaugh**, Holger Müller et al.; *Observation of the Relativistic Reversal of the Ponderomotive Potential*, Phys. Rev. Lett. 124, 2020
- (9) **Carter Turnbaugh**, Holger Müller et al.; *Laser phase plate for transmission electron microscopy*, Nature Methods volume 16, 2019



Berkeley SPS also wishes to congratulate the following graduating seniors who will begin graduate degree programs or employment in the fall: (Please note that this is not an all-inclusive list)

Nicholas Rui (Caltech)	Mingyu Li (MIT)	Peter Connick (UCLA)
Ivan Chernyshev (Univ of Wash.)	MengYang Zhang (Princeton)	Mayia Vranas (UCSD)
Timothy Guo (Harvard)	Hunter Martin (Univ of Waterloo)	Dhruv Muley (Lab Asst. UVictoria)
Aini Xu (Software Developer)	(MIT)	Neel Venugopal (Amazon)
Arani Acharya (Stanford)	Andrew Hsu (Univ. of Florida)	Joshua Yurtsever (Stanford)
Huws Landsberger (Princeton)	Noah Stevenson (UC Berkeley)	Joshua Z. Lin (MIT)
Youqi Song (Yale)	Preston Dicks (USAF)	Jiabao Yang (Cornell)



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Part IV: Off-campus Engagement

“Teach love, generosity, good manners and some of that will drift from the classroom to the home and who knows, the children will be educating the parents.”

—Roger Moore

The Berkeley chapter of SPS is proud and thankful to have a population of students invested in public outreach and service to the community. We realize the impact of outreach on future generations of students in Berkeley’s Department of Physics, and look at public outreach as a way to help shape the environment in the way we dreamed we could have. Under the management of the Outreach Officer, Charlie Cummings, a newly formed ‘Outreach Committee’ consisting of enthusiastic SPS general members were able to organize returns to events held the previous school year as well as new programs in reaction to event cancellations due to wildfires and COVID 19. The Berkeley chapter of SPS was able to reach and inspire a large number of young scientists around California.

STEP UP Postcards (3 November 2018)

In the fall 2019 semester, SPS began the year by taking part in STEP UP’s (an initiative supported by APS to increase the number of womxn minorities in STEM, focusing on high schools) beta testing of outreach materials. Multiple members wrote postcards to local high school teachers, urging them to sign up for the program. Recently, Charlie Cummings joined the Student Leadership Team of STEP UP, helping roll out national initiatives to help support the program.

Bay Area Science Festival(8 December 2018)

As an SPS outreach classic, a large number of students participated in the Bay Area Science Festival hosted in Oracle Park. With a booth in the young teens section, we demonstrated interactive demos revolving around “How Things Move,” including the chaotic pendula and Van de Graaf generator. SPS was also able to connect with other volunteer groups for a possibility of future collaboration.



(Above) Enthusiastic physics students grinning ear to ear following a day of volunteering at the Bay Area Science Festival at AT&T Park, San Francisco. Collectively, Bay Area Science Festival events reach 50,000 people per year and gives Berkeley SPS an opportunity to creative formative scientific experiences in the minds of future scientists.



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BASIS (8 March 2019)

The Berkeley chapter of SPS had scheduled early in the school year to collaborate with BASIS during the spring semester to bring safe and fun demonstrations to the classroom setting. COVID 19 brought an abrupt change to teaching styles, including an online transition for elementary aged children. With effort, we were able to adapt the demonstration to an interactive online presentation, and visited more than 10 classrooms online to promote STEM via play-doh circuits.

AP Review (13 April 2019)

In late April, Charlie Cummings and Nicholas Rui held a number of AP Physics review sessions for students at a number of schools preparing to take the AP Physics 1, 2, and C: Mechanics exams during the unprecedented COVID-19 pandemic. Students were guided through a number of topics including kinematics, momentum, and rotation, with generally positive reception from students, parents, and teachers.



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Part V: The SPS Mission

“The SPS exists to help students transform themselves into contributing members of the professional community. Course work develops only one range of skills. Other skills needed to flourish professionally include effective communication and personal interactions, leadership experience, establishing a personal network of contacts, presenting scholarly work in professional meetings and journals, and outreach services to the campus and local communities.”

—SPS’s mission statement

Who We Are

With the University of California, Berkeley as a backdrop, Berkeley’s Society of Physics Students upholds the mission of the national organization. Namely, Berkeley SPS aims to supplant the high-quality academics of our parent campus by helping our members becoming model citizens and leaders of the professional community at large.

In an inclusive and diverse setting, our local chapter promotes the academic success and professional development of our student body.

Academically, we host a number of programs aimed at encouraging collaboration throughout the undergraduate population. In particular, our Physics 5A Study Halls target students at the earliest stage of their academic development and bolsters a cooperative approach to problem solving. Furthermore, as the academic paths of our student body naturally diverges based on interest, we offer a number of programs that help ensure the spread of ideas, our most regular of which are the Undergraduate Seminars and the Homework Parties. The former directly allows for the proliferation of conceptual ideas amongst members by providing a platform for novel physics and mathematics to be shared and the latter allows for individuals to enhance their technical abilities by approaching UC Berkeley’s challenging problem sets in a relaxed group setting.

Professionally, Berkeley SPS helps our members access the necessary doors to get them onto the path of their choice, whether they are interested in pursuing a career in academia or industry. For those interested in a research career in either path, we offer a number of “How to get research” events wherein we detail the best ways to approach a potential research advisor. Furthermore, our active involvement in promoting career panels and graduate panels, allow members to engage with their preferred potential career option. In any case, the skill-based workshops that we offer (e.g. the LaTeX workshop and Python workshop), help members learn professional tools that make them an appealing candidate in any job market. Moreover, the forgoing Undergraduate seminar provides a much-needed platform for public speech and communication, needed in any industry.

All of these are done in the inclusive setting that Berkeley SPS provides. Our local chapter is committed to providing our members with a safe and accepting social environment that promotes good mental health practices. This social environment is built by programs that Berkeley SPS hosts (e.g. our Mentorship program), conversations our chapter engages in (e.g. our several mental health and sexual harassment workshops), and the casual day-to-day events that establish a friendly zeitgeist to the department (e.g. the Berkeley SPS Instagram, the Integration Bee, “Order-of-Magnitude Game”, etc.).

In addition to establishing the aforementioned inclusive setting within the walls of our department, Berkeley SPS seeks to do its part to establish it in the broader community. To this end, Berkeley SPS is unequivocally devoted to community service and outreach, seeking both to spread



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a love of physics and to create numerous opportunities for the upcoming generation of future scientists. This is evidenced by the numerous outreach events (e.g. the Bay Area Science Fest, Bay Area Scientists in Schools, etc.) that our chapter supports and the dozens of volunteers that we get for such events. All-in-all, SPS acknowledges that good physics requires an educated society with the opportunities that it needs to flourish.

Hence a conclusion left unstated most days of the year, the Society of Physics Students chapter at the University California, Berkeley stands as a proud representative of the values outlined in the national organization's mission statement. The message described therein is one to which our local chapter has been and will for many years continue to be unapologetically committed.

Getting out the Word

Throughout this past academic year, Berkeley SPS has extensively utilized **technology** and **social media** to **get the word** out on the club's **numerous activities** and **community activism**. When it comes to all things “happening” at Berkeley’s Department of Physics, Berkeley SPS wants everyone to know!

Email Newsletter

To keep its members in the loop, SPS at Berkeley sends out a quirky newsletter detailing SPS **events, departmental resources, and professional opportunities**. The newsletter is typically dispersed on Monday mornings from our official email, **ucbsps@gmail.com**, to over 600 subscribers. The newsletter is usually the first time most members hear about the general meeting topic, undergraduate seminar, DeStress with SPS, and outreach/projects events.

Website: sps.berkeley.edu/

Berkeley SPS’s website provides information for Berkeley SPS members, current and prospective Berkeley students, and the broader undergraduate physics community. The website provides **resources** for students, **archives past Berkeley SPS activities**, and helps **coordinate**



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future Berkeley SPS events. This year, the previously described UC Berkeley Physics Undergraduate Wiki was added.



(Above) A screenshot of the loading homepage of the Berkeley SPS website. The continuously updated website allows Berkeley SPS to get the word out on new and exciting things happening in the department.

SPS Instagram: @sps_berkeley & Facebook Group

Headed by Media Chair Benjamin Lloyd, SPS utilizes various social media platforms to promote SPS events. The Berkeley SPS Facebook is managed by the media chair, who publishes events, resources, and reminders of social, professional, and outreach events the day of. The official Berkeley SPS Instagram account is handed to a new individual every week to be ‘influencers’, highlighting glimpse into the day-to-day lives of SPS members. It helps **encourage balanced lifestyle** and **increase friendship** as members discover similar interests that did not happen to come up in academic conversations.

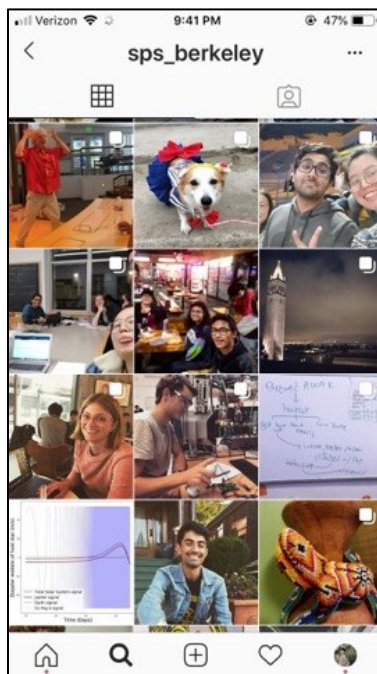
SPS Instagram Schedule

(Week of)		12.2.2019	Christian Ramos
6.17.2019	Allison O’Brien		
6.24.2019	Eden McEwen	12.23.2019	Michelle Lee
7.1.2019	Shaunak Modak	12.31.2019	Charlie Cummings
7.8.2019	Mayia Vranas	1.6.2020	Yi Zhu
7.15.2019	Erika Hathaway	1.13.2020	Alexander Qualls
7.24.2019	Pat Sciurello	1.21.2020	Anthony Vogliano
7.28.2019	Arani Archaya	1.27.2020	Nathan Helvy
8.5.2019	Yilun Ma	2.10.2020	Shashank Dholakia
8.12.2019	Heido Hoo	3.3.2020	Yilun Ma (2 nd)
8.19.2019	Shishir Dholakia	3.9.2020	Mayia Vranas (2 nd)



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9.2.2019	Joshua Lin	3.18.2020	Gabriel Perko-Engel
9.9.2019	Alec Shelly	3.30.2020	Pat Sicurello (2 nd)
9.16.2019	Jinze Wu	3.30.2020	Siddhant Mehrota
9.30.2019	Jo Nguyen	4.7.2020	Arjun Savel (2 nd)
10.7.2019	Arjun Savel	4.15.2020	Rahul Sahay
10.14.2019	Olivia Kong	4.27.2020	Richard Chen
10.28.2019	Debayan Bandyopadhyay	5.4.2020	Arani Archay (2 nd)
11.4.2019	Shirley Yu	5.18.2020	Nicholas Rui
11.11.2019	Kenny Chen	5.25.2020	Emily Glazer
11.18.2019	Binhan Hua	6.1.2020	Aini Xu
11.25.2019	Yonna Kim		



(Above) A screenshot of some pictures featured on the SPS Instagram. While Media officer Ben Lloyd made sure that the posted content was appropriate and safe, the freedom of student ‘influences’ allows an unfiltered view into the day-to-day life of a physics student.